



Innovation of Vocational Technology Education

Available online at <http://ejournal.upi.edu/index.php/invotec>



The Role of Vocational Education in Logistics and Supply Chain Development

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ARTICLE INFO

Article history:

Received: 07 December 2020

Received in revised form: 13 January 2021

Accepted: 13 February 2021

Available online: 28 February 2021

Keywords:

logistics;

supply chain;

vocational education

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ABSTRACT

Technical and Vocational Education Training (TVET) is one of the institutions that focuses on ready-to-work graduates. This study aims to identify vocational education in logistics and supply chain in producing a workforce that meets logistics industry standards. The research method used is Systematic Literature Review (SLR) using sources from scientific articles published in the last 10 years around 2011 to 2021. The results of the study found that in the development of the logistics program there was a lack of student awareness of the potential and discipline as a career field. The capabilities that must be possessed include logistics curriculum, TVET curriculum, TVET learning, TVET skills, soft skills, technical skills, administrative skills, managerial skills, professional skills, communication skills, technology skills, worker skills, logistics performance. TVET has a central working pattern, collaborates with other institutions, develops a training curve according to field needs, with innovative and sustainable technology and information.

1. Introduction

The development in logistics and supply chain has increased drastically. On the other hand, the increased complexity exposes the company to have more challenges and risks such as the emergence of new technologies, initiatives for continuous innovation, fluctuations in demand and market policies, etc. The development of advanced information and communication technology is able to reduce risks and increase the company's competitive advantage. However, advanced technology and changes in the business environment are also accompanied by new human resource needs (Sun & Song, 2018).

Another study describing a survey conducted by DHL of 350 professionals in supply chain operations shows that there is a talent shortage crisis along with the rapid development of this field (Harrington & Smith, 2019). Bureau of Labor Statistics report also shows that there is a shortage of talent in the supply chain, possibly due to a lack of specialized training in this field (Lutz, 2013). Employers are concerned about the level of preparation of new graduates as well as the potential availability of a new workforce, given that logistics and supply chains have faster than average job growth.

Following are the results of curriculum analysis for vocational education in India, China, Germany, and the United States. The findings show clearly that the 'principle of discipline' dominates in all countries except China. This is most common in India, where more than three-quarters of all encodings fall under this principle. However, also in Germany and the United States the 'principle of discipline' attracted about two-thirds of all coding. Moreover, it is surprising that in China the 'principle of personality' dominates compared to other countries (although it is also an important dimension in the US, with a quarter of all USA coding). The 'situation principle', by contrast, is drawn to just under one-third of all encodings in China, followed by Germany, where this dimension makes up about one-fifth of coding. However, the interpretation of these comparative findings requires caution as the linkages between findings and explanations are primarily hypothetical at this level. One of the reasons for the dominance of 'Discipline principles' is undoubtedly the fact that input-oriented curricula have traditionally been heavily shaped by the content and learning outcomes in all the countries analyzed and that these learning outcomes are oriented towards specialist disciplines (CEDEFOP, 2012). At least two further factors played a role. First, the status of subjects / courses is legalized worldwide in relation to their close ties to a particular discipline.

From a comparative perspective, it is clear that the pre-vocational education approaches differ in both theory and practice, as they fulfill very different roles in society and in the training system.. From a research perspective, it is surprising that pre-vocational education has received little attention in comparative studies, given that the findings are rich and yield much material for international training policy debate.

In Indonesia, the curriculum is structured in relation to the results of the competency achievements of graduates, also referring to the learning outcomes resulting from an education vocational education, so it is necessary to properly assess the appropriate curriculum in vocational education the resulting graduates will be able to compete in the world of work, absorbed in the world of work according to the needs. The current curriculum development refers to the Standards Indonesian National Work Competency (SKKNI) or international standards. One of the 2017-2025 Indonesian vocational development policy roadmap, which is the curriculum which are too general in vocational schools (Afrina et al., 2018). Based on policy It can be seen that one of them is about the curriculum that is too general in schools vocational education, this proves that there are still problems that occur from the curriculum for vocational at this time, so it is necessary to make improvements carefully in arranging a harmonious curriculum. The curriculum must have relevance

with: 1) The conformity of the curriculum with demands, needs, conditions, and community development. 2) Compatibility between curriculum components, namely the content according to the objectives, the process according to the content and objectives, evaluation in accordance with the process, content and objectives of the curriculum. For the vocational education curriculum contains guidelines work competency development program for standardized graduates of the world of work (Sudira, 2018). Curriculum TVET as a complete and complete learning program contains a foundation theoretical philosophy of the program, competency profiles of graduates, competency standards of graduates, learning outcomes, subject structure, syllabus descriptions, implementation plans learning, learning modules, lab sheets, work sheets, assessment tools, tests competency and competency certification.

Therefore, in order to provide adequate graduates or workforce according to their needs, vocational education is necessary due to vocational education purpose that is to produce ready-to-work graduates who have the relevant skills for current job employment (Wardina, Jalinus, & Asnur, 2019) in the middle of disrupting in logistic industrial needed. Managing the supply chain has become increasingly more complex as logisticians attempt to adapt to turbulent and competitive market environments. Logistics professionals must be multi-talented, they must have both generalist and specialist knowledge and skills (Thai, Cahoon, & Tran, 2011). Logistics vocational education is an activity that studies the process of planning, implementing, controlling flow, storing goods and materials that are efficient, and cost-effective, as well as related information, from point of origin to end point (consumers) (Boßlsche, 2013).

The teaching load in the vocational education program has been structured to prioritize the load on skills and expertise courses compared to the load on theory courses so that it helps students in the engineering field to implement their academics which are also oriented towards their career paths (Lutz, 2013). It is important for universities to adjust the applied curriculum to suit the dynamic needs of the industry, and the industry needs to be open to the purpose of this systematic literature review is to describe the concept of a vocational curriculum in accordance with the criteria for the need of labor in the industry, logistics industry, to explore tips for creating a competent and skilled workers including hard skills and soft skills, and to find ways to make a collaboration in vocational education more effective to prepare TVET graduates as logistics industrial needed.

2. Methods

In this study, the method used is systematic literature review (SLR). SLR is a specific research or research methodology and development carried out to collect and evaluate research related to a particular focus topic. The main benefit of SLRs is that they provide readily accessible evidence. Scientific articles used in systematic literature review are sourced from national and international journals, in the period 2011-2021. The method that is used is the Preferred Reporting Item Systematic Reviews and Meta-Analytic Method (PRISMA) method. The Inclusion criteria include

research on logistics curriculum, TVET curriculum, TVET skills, soft skills, Logistics industrial needed, Supply Chain skills Worker. The exclusion criteria include education for people with mental disability. The search process begins by reviewing the titles and abstracts of the entire search result and comparing them with established criteria. The research database search resulted in all keywords search results obtained 167 research articles.

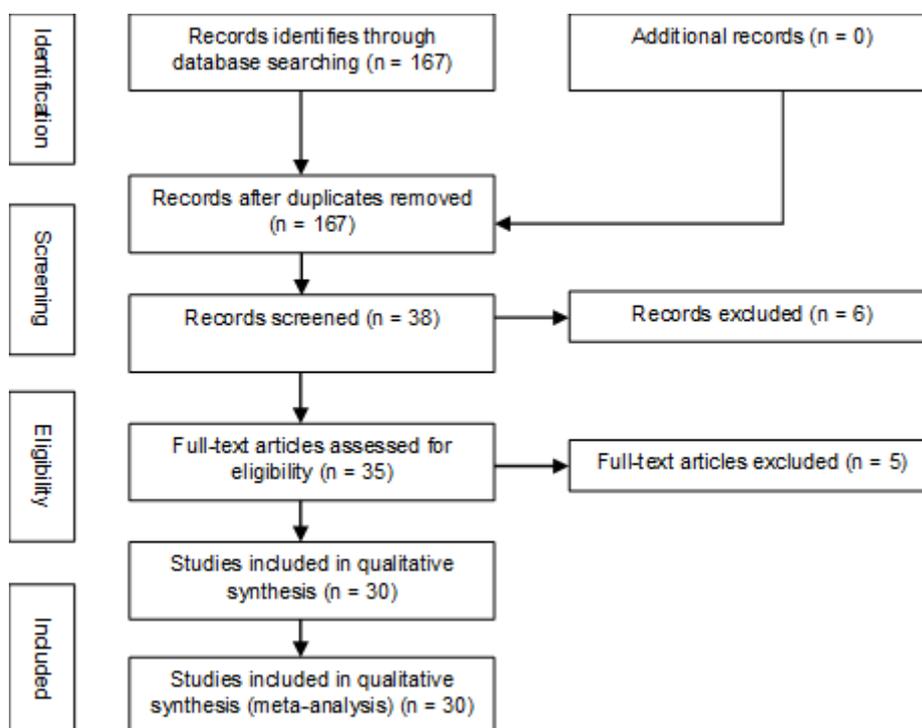


Figure 1. PRISMA methods

Based on figure 1, researcher selection some article that suitable and used in this paper. 30 articles is used in this papers to get more information and some research result before in 2011-2021. In this paper, provides an overview of the rules and regulations in TVET to produce graduates in accordance with the needs of the logistics industry and supply chain.

3. Results and Discussion

In this research, the authors used some keywords to find more information related with the focus of this study. Keywords are TVET curriculum in 7 articles, TVET skills 5 articles, soft skills 3 articles, Logistics industrial needed 8 articles, Supply Chain skills Worker 7 articles. More detail it describes in table 1, as bellow:

Table 1. List of keywords

No	Keywords	Description	Resource
1	TVET curriculum	This keyword includes articles on logistics curricula and curricula in TVET	(Albashiry, Voogt, & Pieters, 2015), (Barliana, et al., 2020), (CEDEFOP, 2012), (Rahmawati, et al., 2021), (Reeve, 2016), (Sudira, 2018), (Wardina et al., 2019)
2	Logistics industrial needed	This keyword includes articles that discuss the performance and capabilities of workers required by the logistics industry	(Boßsche, 2013), (Cevik Onar et al., 2013), (Kotzab et al., 2018), (Lau et al., 2018), (Lutz, 2013), (Ozment & Keller, 2011), (Putz, Treiblmaier, & Pfoser, 2018), (Sun & Song, 2018), (Thai et al., 2011)
3	Supply Chain skills Worker	This keyword includes articles that discuss the performance and capabilities of the supply chain sector	(Abidi, De Leeuw, & Klumpp, 2014), (Gámez-Pérez et al., 2020), (Harrington & Smith, 2019), (Jordan & Bak, 2016), (Sarrico & Rosa, 2016), (Scholten & Dubois, 2017), (Tatham et al., 2017)
4	TVET Skills	This keyword includes articles that discuss the technical and non-technical skills workers need to perform well in the TVET area	(Afrina et al., 2018), (Boateng, 2012), (Khaled et al., 2014), (Reeve, 2016)
5	Soft Skills	This keyword includes articles that discuss the soft skills workers need to perform well in the logistics industry	(Ana et al., 2018), (Muhammad, 2017), (Wu et al., 2016)

Department of labor: Logistics experts will experience 25 percent job growth from 2010-2020 (labor statistics bureau 2012) due to a faster than average job growth rate. This has the potential to result in a shortage of skilled employees in the future. Then, employers worry about the preparation of graduates to meet their company standards. Therefore, logistics vocational education is needed to face these challenges. Ozment and Keller (2011) explained that research shows that there are important obstacles to the development of logistics / supply chain programs. These include students' lack of awareness of the discipline and its potential as a career field, a lack of supply of qualified faculty a lack of appropriate courses, especially in business lack of interest by employers and disagreement between academics and industry professionals about what should be an appropriate curriculum. As suggested by some researchers (Cevik Onar et al., 2013), educational programs in L and The SCM should be designed on the basis of a two-step process: (i) identification of logistics

and supply chain competencies and skills defined by the business environment, and (ii) curriculum development and improvement of teaching methods for effective knowledge transfer. Logistics education is not only the job of training or educational institutions but requires collaboration with professionals in the logistics and supply chain industry. This collaboration can be carried out using various methods, industry professionals as guest lecturers can provide insight into field practice as well as specific knowledge of the logistics industry (Thai et al., 2011).

3.1 Logistic vocational education curriculum

Education and training in the field of logistics is increasing due to the dynamic humanitarian logistics process. Logistics experts want their work to be more professional, that "technical logistics training" is among the three most important areas for professional development. In this case education and training programs must be very practice-oriented rather than theory-oriented (Lutz, 2013). The training is intended to prepare a competitive specialist workforce, capable of carrying out professional activities supported by skills using modern equipment for technological development (Akhmetov et al., 2016).

Curriculum used must have relevance to: 1.) The conformity of the curriculum with the demands, needs, conditions, and development of society, 2.) Conformity between curriculum components, namely content that is in accordance with objectives, process in accordance with content and objectives, evaluation in accordance with the process, content and objectives of the curriculum (Wardina et al., 2019) and for the vocational education curriculum according to Sudira (2018), Technical and Vocational Education and Training (TVET) contains guidelines for work competency development programs for world-standard graduates. Teachers have a central role, collaborating with companies and other institutions, to compile a training curriculum that is compatible with field needs (Gentili, 2017). Teachers must have a set of competencies (Jeon et al., 2017) which includes teaching design, teaching and learning guidance, research on teaching content, research on teaching methods, career and interpersonal relationship guidance, management support for school and class, and cooperation.

Field trips have proven to be an effective teaching activity in the practice of logistical vocational education. Partnerships between industry, education and research in carrying out field trips are needed to create a positive effect (Putz et al., 2018). Especially in logistical vocational education activities. Precise measurement and various reciprocal relationships ensure that all parties participate in measuring the effectiveness of activities and are able to fully understand the objectives of fieldwork visits (Putz et al., 2018).

Collaboration between academia and industry creates attractive options for SCM and logistics education. These partnerships help to avoid the risk of being incompatible with the discipline being pursued. By holding field work visits, the impact is increased communication that is established as a result of the need to coordinate trips and help to forge closer relationships between partner organizations (Putz et al., 2018).

On the other hand, express learning with active learning methods (Scholten & Dubois, 2017). The active learning process affects the learning process and learning outcomes. Students who are actively involved and have responsibility in active learning activities are considered capable of developing high-level learning related to the skills needed in the world of work environment. Active learning methods allow learning to occur in various ways with different schemes. This will help to close the gap between what practitioners need and the curriculum to be delivered.

The method used to determine the effectiveness of the logistical vocational education process is by means of "learning assessment" (Abidi et al., 2014). Learning assessment, which is a way of delegating to each school to determine the effectiveness of the education it does. Usually the assessment is measured by matching specific questions on student examinations, which are monitored over time. However, this method does not assess the effectiveness of the curriculum whether they meet industry needs or not (Abidi et al., 2014). In addition, to improve the academic preparation of students, educational institutions tend to arrange more support in the form of additional classes for students, including intensive classes to prepare them for their final exams. These classes are of course open and flexible for students, they can decide whether to take additional classes or not (Sarrico & Rosa, 2016). The criteria for future job success in logistics, using structural equation modeling (SEM), they specifically tested the impact of educational experiences and work-related skills (social aspects, decision making, problem solving and time management). From the results of the study, it was found that job-related skills were the only major determinant of job success statistics. There is no support regarding the role of experience or education in job success (Abidi et al., 2014). However, although graduates have good Engineering skills, there is something more that needs to be emphasized namely, behavioral skills (decision making and people management skills, business ethics and training. These skills can be further developed through innovative and collaborative relationships between industry and tertiary education (Jordan & Bak, 2016).

It revealed that research conducted in 2014 that logistics vocational education did not meet the needs of employers, especially industry (Abidi et al., 2014). It delivered three criticisms regarding logistics education, namely:

- Lack of market relevance;
- Lack of development of practical and professional skills;
- Poor research ability on the part of students.

It describes how to make collaboration in vocational education more effective. The proposed model consists of three phases, namely (Gámez-Pérez et al., 2020):

- Phase 1 includes establishing collaboration between stakeholders. As a first step, company upgrade opportunities trigger collaboration requests (i.e. projects).
- Stage 2:
 - I. Selection of SCM competencies that will be strengthened or developed in project participants; and
 - II. The guidance method, namely a work scheme by involving students in projects and interacting with their professors.
- Phase 3 includes project development and field studies in collaboration with the company.

It describes a study involving several respondents regarding how universities should design and develop logistical vocational education programs (Thai et al., 2011). More detail it showed in table 2 as below:

Table 2. How should universities design and develop educational programs

How educations program should be developed	Number of responses
Consultation with logistics association	121
Consultation with other business associations	98
Consultations with international universities	77
Design and implement by own training program	21
Others	11

Source: (Thai et al., 2011)

There are a number of areas of knowledge and skills that have been emphasized through a number of studies, for example the categorization of skills in managing logistics such as business skills, logistics skills to management skills. Ability to research and identify transportation and logistics, general business administration and business ethics, are very important skill areas in the industrialized world. The result of their research is that there is an overlap between several areas of management skills, namely Human Resource management, strategic management, which includes skills in doing business, as well as in the logistics business. If these skills can be applied to logistics education as best as possible, it is hoped that it will produce quality graduates who are ready to work and face challenges, to compete with the international market. The following are logistics skills and managerial skills as well as logistics capabilities including:

- Traffic / transportation management
- Customer service and warehousing
- Managerial competency
- Personal integrity
- Ability to motivate and to plan
- Human resources management / strategic management
- Soft skills

It will probably always be a question of why students' research abilities should be developed and their relevance for future professionals. The answer is that the level of education in vocational tertiary institutions must develop basic academic abilities. What's more, research is a creation of knowledge and a way to gain new knowledge. In addition, by conducting research, students' thinking will be sharpened to become more sensitive to the issues and problems that occur or will be faced. Students must know how to generate and interpret new knowledge, such as practical approaches to business development and analysis, comparing and analyzing competitors and market research, and benefits of the research itself. In one of the journals we studied, there is an example, a logistics services company, they presented the evolution in the logistics services sector, where service providers are increasingly involved in client supply chain design. This poses a serious knowledge challenge for them as well as the company, they should actively seek new employees who are able to do supply chain analysis, learn about improvement opportunities and present them to clients.

The curriculum must be shaped and implemented as well as possible in order to prevent rejection of prospective workers who, according to themselves, are "mature" but in practice are still not skilled enough. So a trainee program or job training program is needed to re-develop the level of student ability in the field of logistics. In short, there is a need for learning activities or courses that focus on the latest developments in logistics that include professional and research skills development, not only in the field of logistics but also in a broader scope. The following is a breakdown of the disciplines that must be applied:

- Avoiding a narrow functional outlook from a cross-functional perspective;
- Root modeling and technical methods in practice (root modeling and technical methods);
- Using the international curriculum in the face of globalization (internationalise curricula in the face of growing globalization); and
- Focusing empirical work making relevant strategic decisions along the lines of social research.

According to Gámez-Pérez et al. (2020), significant changes occur in education, from education which is dominated by increased skills to an approach that develops knowledge, skills and attitudes that are relevant and work and career development. It related to education in the field of

logistics and their chain found that competence is defined as knowledge based on experience and is context dependent (Gómez-Pérez et al., 2020). In addition, they identify five main competencies of professional logisticians:

- Professional knowledge;
- Business management;
- Communication and teamwork;
- Self-management and improvement; and
- Social responsibility.

In the implementation of the logistics vocational education curriculum, there is a need in the form of learning activities or courses that focus on the latest developments in the field of logistics which include professional and research skill development. An overview of the criteria for graduates needed in the industry:

Table 3. Qualification requirements for vocational education graduates in the field of logistics

No.	Graduate Criteria Needed by Logistics Industry
1	Efficiency
2	Negotiation Capacity
3	Independence and own initiative
4	Analytical problem-oriented work
5	Flexibility and adaptability quality management
6	Quality management
8	Work virtues
9	Implementation of industry specific knowledge and experience
10	Stress resistance
11	Legal knowledge and customers focus
12	Competency profile
13	Strategic orientation, determine/control the company completely
14	Coordinate work
15	Understand the solution to complex technical problems
16	Creativity basic knowledge of business administration
17	Perceived loyalty of management organizational functions
18	Conceptual risk taking of working in the immediate workplace
19	Planning and controlling procurement and logistical processes
20	Ability to write and speak well
21	Foreign language knowledge
22	Charismatic
23	Ability to apply modern information and communication technology (workplace)
24	Promotes responsible care

Source: (Boßlsche, 2013)

Based on table 3, it showed that more qualification or criteria needed in logistics industry sector. It must be more attention in vocational education to prepare students can fulfill this criteria. By table 2 and table 3, vocational education is an institution prepare workers by logistics industry, actually in Indonesia it still must be developed by vocational education. In lack of that logistics industry is one of industry that has a good opportunity in industrial sector.

4. Conclusion

Logistics in vocational education is carried out through higher education or courses that are useful for developing students to have certain applied expertise jobs. The logistics sector continues to experience development. Thus, the need for skilled human resources to handle this field also increases so that logistical vocational education is needed to deal with challenges such as lack of market relevance, lack of development in practical and professional skills, and poor research capacity on the part of students. Based on the literature we have examined we have found that job-related skills are the single major determinant of job success statistics. In the logistics business, these skills are in the form of Human Resources management, managerial (personal integrity, ability to motivate and plan), logistics (traffic / transportation management, customer service and warehousing), and Soft skills. In communication, leadership, the ability to work in teams, accounting, to marketing). Students must hone their way of thinking by conducting a study in order to be more sensitive to the issues and problems that occur or will be faced. Students are expected to be able to interpret new knowledge, compare and analyze competitors and market research (practical approaches to business development and analysis), to find out the benefits of the research itself. Seeing that in the implementation of the logistics vocational education curriculum there is a need in the form of learning activities or courses that focus on the latest developments in the field of logistics which include the development of professional skills and research (professional and research skill development).

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